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FLOOD INSURANCE STUDY

ORIGINAL

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CITY OF NEOLA, IOWA

POTTAWATTAMIE COUNTY

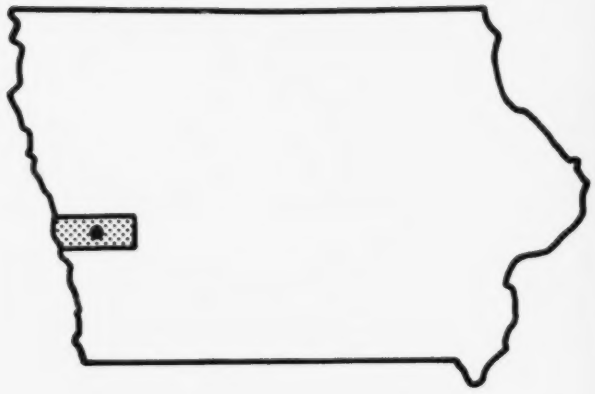

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TABLE OF CONTENTS

		Page
1.0	INTRODUCTION	1
	1.1 Purpose of Study	1
	1.2 Authority and Acknowledgments	1
	1.3 Coordination	2
2.0	AREA STUDIED	3
	2.1 Scope of Study	3
	2.2 Community Description	3
	2.3 Principal Flood Problems	5
	2.4 Flood Protection Measures	6
3.0	ENGINEERING METHODS	7
	3.1 Hydrologic Analyses	7
	3.2 Hydraulic Analyses	9
4.0	FLOOD PLAIN MANAGEMENT APPLICATIONS	11
	4.1 Flood Boundaries	11
	4.2 Floodways	12
5.0	INSURANCE APPLICATION	15
	5.1 Reach Determinations	15
	5.2 Flood Hazard Factors	16
	5.3 Flood Insurance Zones	16
	5.4 Flood Insurance Rate Map Description	17
6.0	OTHER STUDIES	19
7.0	LOCATION OF DATA	19
8.0	REFERENCES AND BIBLIOGRAPHY	19

TABLE OF CONTENTS - continued

Page

FIGURES

Figure 1 - Vicinity Map 4
Figure 2 - Floodway Schematic 14

TABLES

Table 1 - Summary of Discharges 8
Table 2 - Floodway Data 13
Table 3 - Flood Insurance Zone Data 18

EXHIBITS

Flood Profiles
Mosquito Creek Panel 01P
Neola Creek Panel 02P
Flood Boundary and Floodway Map

PUBLISHED SEPARATELY:

Flood Insurance Rate Map

FLOOD INSURANCE STUDY

CITY OF NEOLA

POTTAWATTAMIE COUNTY, IOWA

1.0 INTRODUCTION

1.1 Purpose of Study

This Flood Insurance Study investigates the existence and severity of flood hazards in the City of Neola, Pottawattamie County, Iowa, and aids in the administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. This study will be used to convert the City of Neola to the regular program of flood insurance by the Federal Emergency Management Agency. Local and regional planners will use this study in their efforts to promote sound flood plain management.

In some states or communities, flood plain management criteria or regulations may exist that are more restrictive or comprehensive than those on which these Federally-supported studies are based. These criteria take precedence over the minimum Federal criteria for purposes of regulating development in the flood plain, as set forth in the Code of Federal Regulations at 44 CFR, 60.1(d). In such cases, however, it shall be understood that the state (or other jurisdictional agency) shall be able to explain these requirements and criteria.

1.2 Authority and Acknowledgments

The source of authority for this Flood Insurance Study is the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973.

The hydrologic and hydraulic analyses for this study were performed by DeWild Grant Reckert and Associates Company for the Federal Insurance Administration, under Contract No. H-4739. This work, which was completed in February 1981, covered all significant flooding sources affecting the City of Neola.

1.3 Coordination

An announcement of intent to perform a flood elevation study was published three times in the Neola Gazette-Reporter and Minden-Shelby News during October of 1980. The initial Consultation and Coordination Officer's (CCO) meeting was held on June 25, 1979, at the Pottawattamie County Courthouse, Council Bluffs, Iowa. This meeting was attended by personnel representing DeWild Grant Reckert and Associates Company (Study Contractor), the Federal Emergency Management Agency, and the Iowa Natural Resources Council (State Coordinator). The purpose of the meeting was to select a community base map, identify streams to be studied, initiate the data gathering and community input processes, and provide general information on the nature and impact of the Flood Insurance Program.

During the course of study, coordination was maintained with the City of Neola to insure efficient and comprehensive data collection and analyses as well as proper flood and floodway delineation.

A current street map of Neola was obtained from the Neola City Clerk. A newspaper account of past flooding on Mosquito Creek on September 15, 1972 was obtained from the office of the Council Bluffs Nonpareil.

Contact was made with the Iowa Natural Resources Council (INRC) to assemble any pertinent information or data which was available in the INRC office. Also, coordination of the hydrologic and hydraulic methodologies used for this study was maintained with the INRC during the course of the studies.

The U.S. Army Corps of Engineers (COE) and the U.S. Department of Agriculture, Soil Conservation Service, were also contacted for pertinent information.

On October 5, 1981, the preliminary report of the Neola Flood Insurance Study was reviewed at the final meeting held at the Neola City Hall and attended by representatives of the study contractor, the Federal Emergency Management Agency, and public and private interests of the City of Neola.

2.0 AREA STUDIED

2.1 Scope of Study

This Flood Insurance Study covers the incorporated area of the City of Neola, Pottawattamie County, Iowa. The area of study is shown on the Vicinity Map (Figure 1).

The areas studied by detailed methods were selected with priority given to all known flood hazard areas, and areas of projected development or proposed construction for the next five years, through February 1986. Flooding caused by overflow of Mosquito Creek and Neola Creek were studied in detail.

No area was selected for approximate study.

The flood hazard determinations were based on hydrologic and hydraulic conditions that existed at the time of the study or which would be in effect within five years after the study was completed. The streams to be studied using detailed methods were approved by the City of Neola and the Federal Emergency Management Agency prior to initiation of the study.

2.2 Community Description

The City of Neola is located approximately in the northwest quarter and completely surrounded by Pottawattamie County,

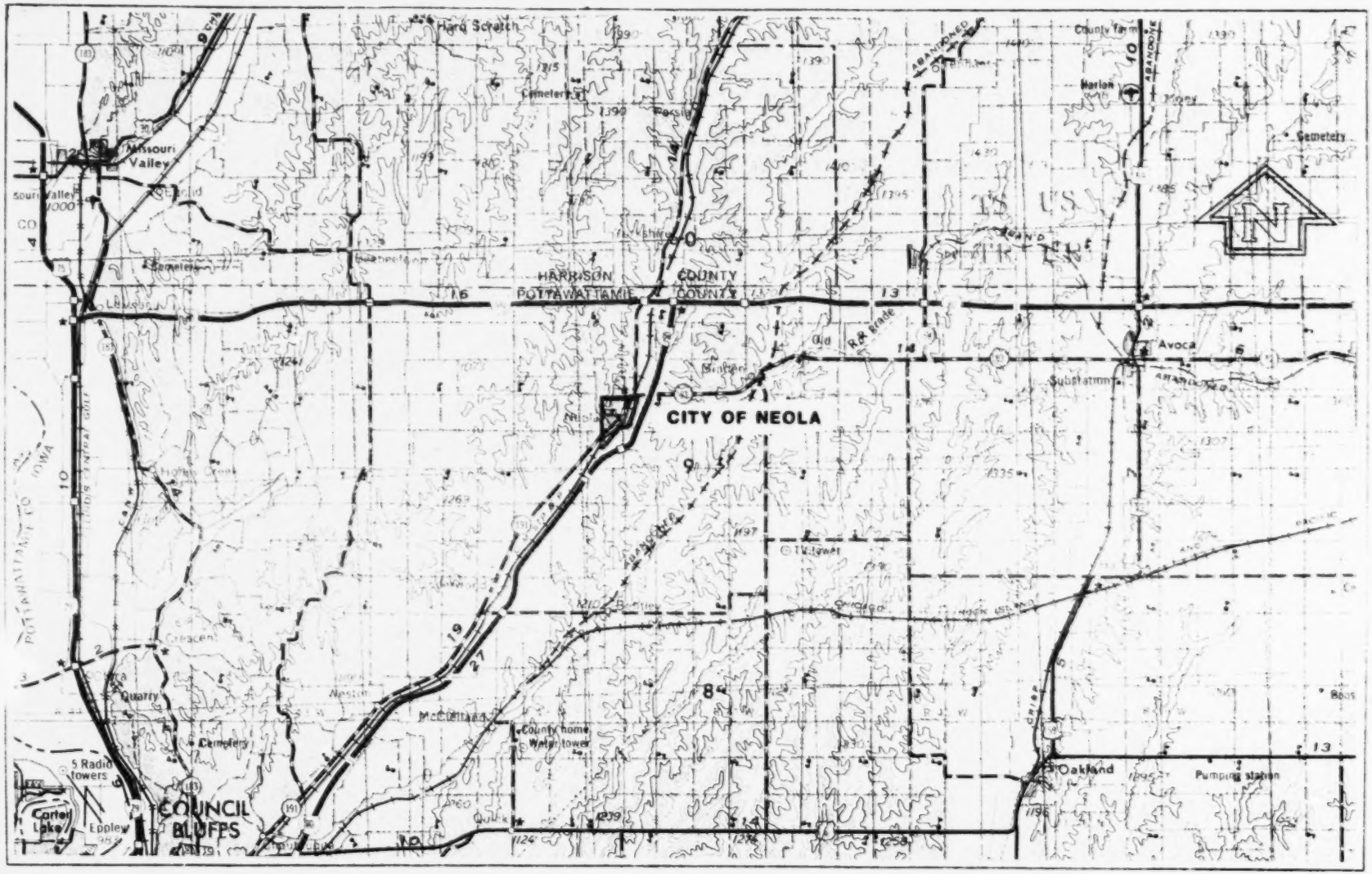

FIGURE 1

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF NEOLA, IOWA

(POTTAWATTAMIE COUNTY)

APPROXIMATE SCALE

4 0 4 8 12 MILES

VICINITY MAP

4

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which is in southwest Iowa. The population of Neola was 968 persons according to the 1970 census, which was an increase of 98 from the 1960 census (Reference 1). The economy of the Neola area is predominantly agriculture and agricultural-oriented business and industry.

The entire incorporated area of Neola lies in the Mosquito Creek drainage basin, as illustrated on Figure 1. The topography consists of broad, rolling uplands with fairly wide flood plains.

The climate of the Neola area is subhumid midcontinental with the annual precipitation averaging 32 inches. An average of 77 percent of the year's total rain falls from April to September; areal distribution of rainfall is generally uniform, except for some summer thunderstorms which may be more intense in certain locales. The mean temperature is 52 degrees Fahrenheit (F.), with the coldest and warmest months being January and July with average temperatures of 22 degrees F. and 76 degrees F., respectively (References 2 and 3).

The flood plain of Mosquito Creek is used primarily for agricultural purposes although several large businesses are also adjacent to the Mosquito Creek. Trees, shrubs, weeds, and grass abound in the undeveloped and uncultivated portions of the flood plains. In cultivated areas, crops of corn, soybeans and oats are commonly found. Soils in the Neola area are not known to have any special characteristics that would significantly affect flood hazards.

2.3 Principal Flood Problems

The past history of flooding in Neola indicates that flooding may occur during any non-winter month. Most floods have been in the spring or early summer as a result of heavy rainfall and/or snowmelt. However, locally heavy thunderstorms in late summer or autumn have also caused flooding problems.

The following account was taken directly from the Council Bluffs Nonpareil newspaper files (Reference 4).

Council Bluffs Nonpareil - Friday, September 15, 1972

"One of the casualties of the week-long floods in southwest Iowa was a bridge on a county road east of Neola which went over Mosquito Creek. Workmen from the Pottawattamie County Engineer's office had closed the bridge earlier in the week when pilings were weakened by tons of trash floating down the creek. A large maple tree apparently knocked out the remaining pilings and the bridge, a steel structure with wooden approaches, fell into the creek. The deck of the bridge is now sitting in the creek about 80 yards downstream from the road."

Several major floods have occurred in Neola in the last century, however no verifiable information could be obtained relative to the magnitude and reoccurrence interval of these floods.

2.4 Flood Protection Measures

At the time of this study, an agricultural levee existed on the right (west) bank of Neola Creek, which provided limited flood protection to farm land lying west and south of the creek. Also, a levee exists on the left (east) bank of Neola Creek, which ties back into high ground near the southwesterly extension of High Street. This levee provides limited flood protection from Neola Creek to about a 4-block area lying downstream from the tie-back levee and landward of the levee. The west levee is in fair to poor condition, with some visible signs of settlement and considerable tree growth in some areas. The east levee is in very poor condition, containing extensive tree growth, a narrow top width (2 to 7 feet), and signs of erosion and settlement. The amount of flood protection offered by these levees was analyzed during this study and is further discussed in Section 3.2, Hydraulic Analysis.

Non-structural measures of flood protection are being utilized to aid in the prevention of future flood damage. These are in the form of land use regulations adopted from the Code of Federal Regulations which control building within areas that have a high risk of flooding (Reference 5).

3.0 ENGINEERING METHODS

For the flooding source studied in detail in the community, standard hydrologic and hydraulic study methods were used to determine the flood hazard data required for this study. Flood events of a magnitude which are expected to be equalled or exceeded once on the average during any 10, 50, 100, or 500 year period (recurrence intervals), have been selected as having special significance for flood plain management and for flood insurance premium rates. These events, commonly termed the 10, 50, 100, and 500 year floods, have a 10, 2, 1, and 0.2 percent chance, respectively, of being equalled or exceeded during any year. Although the recurrence interval represents the long term average period between floods of a specific magnitude, rare floods could occur at short intervals or even within the same year. The risk of experiencing a rare flood increases when periods greater than one year are considered. For example, the risk of having a flood which equals or exceeds the 100-year flood (one percent chance of annual occurrence) in any 50 year period is about 40 percent (4 in 10), and for any 90 year period, the risk increases to about 60 percent (6 in 10). The analyses reported here reflect flooding potentials based on conditions existing in the community at the time of completion of this study. Maps and flood elevations will be amended periodically to reflect future changes.

3.1 Hydrologic Analyses

Hydrologic analyses were carried out to establish peak discharge-frequency relationships for floods of the selected recurrence intervals for each flooding source studied in detail in the community.

For Mosquito Creek and Neola Creek in Neola, stream gaging records are not available. Therefore, it was necessary to estimate the flood discharge-frequency data based on other similar sized streams having flow records and located in the general vicinity of Pottawattamie County. Current official guidelines for estimating flood flow are set forth in WRC Bulletin No. 17A (Reference 7). INRC Bulletin No. 11 (Reference 6) preceded Bulletin No. 17A in time; however, according to the U.S. Geological Survey, the methodologies used in Bulletin No. 11 give results similar to those obtained using Bulletin No. 17A.

In order to further evaluate the applicability of the Bulletin No. 11 equations in the general vicinity of Neola, the results of the Bulletin No. 17A analysis of 18 stream gages in southwestern Iowa were derived from the computer printout prepared by the U.S. Geological Survey (Reference 8) and plotted against the respective drainage areas. As was expected, the plotted data was quite scattered; however, the Bulletin No. 11 regional equation did fit the plotted data quite well. From this comparison, it was concluded that the Bulletin No. 11 regional equations provided the best method of estimating the flood discharges for Mosquito Creek and Neola Creek in Neola.

Peak discharges for the 10-, 50-, 100-, and 500-year floods of each flooding source studied in detail in the community are shown in Table 1.

TABLE 1 - SUMMARY OF DISCHARGES

Flooding Source and Location	Drainage Area (sq. mi.)	Peak Discharges (cfs) 10-Year	50-Year	100-Year	500-Year
MOSQUITO CREEK					
Upstream of confluence with Neola Creek	136	6,690	11,440	13,690	19,010
NEOLA CREEK					
At mouth	7	1,630	3,150	3,960	6,140

3.2 Hydraulic Analyses

Analyses of the hydraulic characteristics of the flooding sources studied in detail in Neola were carried out to provide estimates of the elevations of floods of the selected recurrence intervals along each of the flood sources.

Channel cross sections for the backwater analysis of Mosquito and Neola Creeks are based on field surveys performed in March 1979. All bridges, dams and culverts were also field surveyed to obtain elevation data and structural geometry. Valley cross sections were developed by photogrammetric methods utilizing aerial photography (1:4800) flown in April 1979 at an elevation of 4,800 feet above mean terrain (Reference 9).

Locations of selected cross sections used in the hydraulic analyses are shown on the Flood Profiles. For stream segments for which a floodway was computed (Section 4.2), selected cross section locations are also shown on the Flood Boundary and Floodway Map.

Channel roughness factors (Manning's "n") which were used in the hydraulic computations were chosen by engineering judgment and based on field observations of the streams and flood plain areas in addition to aerial photographs of the Neola area (Reference 9). The roughness value for the main channel of Mosquito Creek was determined to be 0.05 with flood plain roughness value of 0.08 for all floods.

The starting water surface elevation of Mosquito Creek at the downstream corporate limit of Neola equals the water surface elevation determined from the Pottawattamie County Flood Insurance Study (Reference 10) at this location for a flood of the same recurrence interval. Water-surface elevations of

floods of the selected recurrence intervals were computed through use of the COE HEC-2 step-backwater computer program (Reference 11). Flood profiles were drawn showing computed water-surface elevations for floods of the selected recurrence intervals.

For Neola Creek, hydraulic calculations were also performed for the conveyance area lying between the west and east levees, using a channel roughness value of 0.04. Profiles were then drawn for stream discharges of various magnitudes. By comparing these profiles to the top of levee profiles, it was estimated that overtopping begins at a discharge of about 2,500 cfs. From this analysis, it was determined that the level of protection provided by the levees is about at the 10-year recurrence interval, considering a freeboard allowance of 3 feet.

For the 100-year flood on Neola Creek, it is almost certain that a levee rupture would occur; however, it is not possible to predict whether the east bank levee or west bank levee would rupture first. The worst flooding in Neola would occur if the east levee ruptured first. Therefore, estimates of the peak 100-year flood levels for a rupture of the east levee were made based on topographical data and hydraulic computations. This estimated 100-year flood profile is shown on Panel 02, along with the computed 10-year profile for Neola Creek.

The hydraulic analyses for this study are based only on the effects of unobstructed flow. The flood elevations as shown on the profiles are therefore, considered valid only if hydraulic structures, in general, remain unobstructed and if channel and overbank conditions remain essentially the same as ascertained during this study.

All elevations are referenced from the National Geodetic Vertical Datum of 1929 (NGVD); elevation reference marks used in the study are shown on the maps.

4.0 FLOOD PLAIN MANAGEMENT APPLICATIONS

The National Flood Insurance Program encourages State and local governments to adopt sound flood plain management programs. Therefore each Flood Insurance Study includes a flood boundary map designed to assist communities in developing sound flood plain management measures.

4.1 Flood Boundaries

In order to provide a national standard without regional discrimination, the 100-year flood has been adopted by the Federal Emergency Management Agency as the base flood for purposes of flood plain management measures. The 500-year flood is employed to indicate additional areas of flood risk in the community. For Mosquito Creek, the boundaries of the 100- and the 500-year floods have been delineated using the flood elevations determined at each cross section; between cross sections, the boundaries were mapped by photogrammetric methods from the aerial photography (Reference 9).

For Neola Creek, the 100-year flood boundaries were delineated east of the channel using the estimated 100-year flood elevations at each survyed cross section and interpolating between cross sections. For the land lying west of the west levee, 100-year flood boundaries were estimated from available data and engineering judgment.

The boundaries of the 100- and 500-year floods are shown on the Flood Boundary and Floodway Map. Small areas within the flood boundaries may lie above the flood elevations, and therefore, may not be subject to flooding. Owing to limitations of the map scale, and/or lack of detailed topographical information, such areas are not shown. In cases where the 100-year and 500-year flood boundaries are close together, only the 100-year boundary has been shown.

4.2 Floodways

Encroachment on flood plains, such as artificial fill, reduces the flood-carrying capacity, increases the flood heights of streams, and increases flood hazards in areas beyond the encroachment itself. One aspect of flood plain management involves balancing the economic gain from flood plain development against the resulting increase in flood hazards. For purposes of the National Flood Insurance Program, the concept of a floodway is used as a tool to assist local communities in this aspect of flood plain management. Under this concept, the area of the 100-year flood is divided into a floodway and a floodway fringe. The floodway is the channel of a stream plus any adjacent flood plain areas that must be kept free of encroachment in order that the 100-year flood may be carried without substantial increases in flood heights. Minimum standards of the Federal Emergency Management Agency limit such increases in flood heights to 1.0 foot, provided that hazardous velocities are not produced. A floodway having a surcharge of no more than 1.0 foot has been delineated for this study. The floodways in this report are recommended to local agencies as minimum standards that can be adopted or that can be used as a basis for additional studies.

The floodways presented in this study were computed on the basis of equal conveyance reduction from each side of the flood plain. The results of these computations were tabulated at selected cross sections for each stream segment for which a floodway was computed (Table 2).

The floodways were adjusted wherever possible to exclude areas of existing development and to reduce undue irregularities in floodway width between cross sections. The adjusted floodways were then tested with the HEC-2 computer model to ensure that they satisfied the maximum 1.0-foot rise criterion and further adjusted as necessary.

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FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY (FEET NGVD)	WITH FLOODWAY	INCREASE (FEET)
MOSQUITO CREEK								
A	127,830	679[3]	4,498	3.0	1087.3	1087.3	1087.9	0.6
B	129,950	363[3]	1,942	7.0	1089.8	1089.8	1090.6	0.8
C	132,560	602[3]	4,346	3.1	1094.0	1094.0	1094.6	0.6
D	132,920	391[3]	2,540	5.4	1094.1	1094.1	1094.8	0.7
E	134,430	222[3]	3,133	4.4	1095.4	1095.4	1096.0	0.6
F	134,750	103	1,872	7.3	1095.3	1095.3	1096.0	0.7
NEOLA CREEK								
A	1,900	90[2]	N/A	N/A	1092.5	N/A	N/A	N/A
B	2,300	85[2]	N/A	N/A	1094.8	N/A	N/A	N/A
C	3,050	90[2]	N/A	N/A	1097.5	N/A	N/A	N/A

[1]Feet above mouth [2]Width from toe to toe of levees [3]Entire width outside corporate limits

TABLE 2

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF NEOLA , IOWA
(POTTAWATTAMIE COUNTY)

FLOODWAY DATA

MOSQUITO CREEK, NEOLA CREEK

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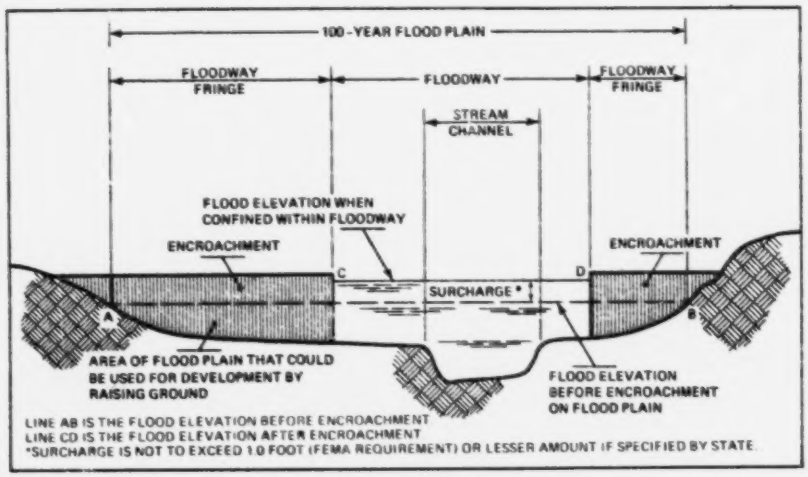
100-YEAR FLOOD PLAIN
FLOODWAY FRINGE
FLOODWAY
FLOODWAY FRINGE
STREAM CHANNEL
FLOOD ELEVATION WHEN CONFINED WITHIN FLOODWAY
ENCROACHMENT
ENCROACHMENT
C
D
SURCHARGE *
A
B
AREA OF FLOOD PLAIN THAT COULD BE USED FOR DEVELOPMENT BY RAISING GROUND
FLOOD ELEVATION BEFORE ENCROACHMENT ON FLOOD PLAIN
LINE AB IS THE FLOOD ELEVATION BEFORE ENCROACHMENT
LINE CD IS THE FLOOD ELEVATION AFTER ENCROACHMENT
*SURCHARGE IS NOT TO EXCEED 1.0 FOOT (FEMA REQUIREMENT) OR LESSER AMOUNT IF SPECIFIED BY STATE

FIGURE 2 - FLOODWAY SCHEMATIC

The area between the floodway and the boundary of the 100-year flood is termed the floodway fringe. The floodway fringe thus encompasses that portion of the flood plain that could be completely obstructed without increasing the water-surface elevation of the 100-year flood more than 1.0 foot at any point. Typical relationships between the floodway and the floodway fringe and their significance to flood plain development are shown in Figure 2.

As shown on the Flood Boundary and Floodway Map, the floodway widths for Mosquito Creek were determined at cross sections; between cross sections, the boundaries were interpolated. In cases where the floodway and the 100-year flood boundaries are either close together or collinear, only the floodway boundary has been shown. Portions of the floodway of Mosquito Creek lie outside the corporate limits.

The floodway for Neola Creek within Neola consists of the channel and any area up to the inside toe of the levees paralleling both sides of the creek. Since a levee failure is almost certain for the 100-year flood, the balance of the flood flow would follow the path of least resistance, which lies west and south of Neola outside of the corporate limits. Floodway calculations were not performed for the channel or this area outside the corporate limits; therefore, no floodway data other than width within the corporate limits is provided in Table 2 for Neola Creek.

5.0 INSURANCE APPLICATION

In order to establish actuarial insurance rates, the Federal Emergency Management Agency has developed a process to transform the data from the engineering study into flood insurance criteria. This process includes the determination of reaches, Flood Hazard Factors (FHF), and flood insurance zone designations for each flooding source affecting the City of Neola.

5.1 Reach Determinations

Reaches are defined as lengths of watercourses having relatively the same flood hazard, based on the average weighted difference in water-surface elevations between the 10- and 100-year floods. This difference does not have a variation greater than that indicated in the following table for more than 20 percent of the reach.

Average Difference between 10- and 100-Year Floods	Variation
Less than 2 feet	0.5 foot
2 to 7 feet	1.0 foot
7.1 to 12 feet	2.0 feet
More than 12 feet	3.0 feet

In Neola, two reaches were determined for Mosquito Creek and one reach delineated for Neola Creek. The reaches are shown on the Flood Profiles and are summarized in the Flood Insurance Zone Data Table (Table 3).

5.2 Flood Hazard Factors

The Flood Hazard Factor is used to correlate flood information with insurance rate tables. Correlations between property damages from floods and their FHF are used to set actuarial insurance premium rate tables based on FHFs from 005 to 200.

The FHF for a reach is the average weighted difference between the 10-year and 100-year flood water-surface elevations expressed to the nearest one-half foot and shown as a three-digit code. For example, if the difference between the water surface elevations of the 10- and 100-year floods is 0.7 foot, the FHF is 005; if the difference is 1.4 feet, the FHF is 015; if the difference is 5.0 feet, the FHF is 050. When the difference between the 10- and 100-year flood water surface elevations is greater than 10.0 feet, the accuracy for the FHF is to the nearest foot.

5.3 Flood Insurance Zones

After the determination of reaches and their respective FHFs, the entire incorporated area of Neola was divided into zones, each having a specific flood potential or hazard. Each zone was assigned one of the following flood insurance zone designations:

Zone A: Special Flood Hazard Areas inundated by the 100-year flood, determined by approximate methods, no base flood elevations shown or FHFs determined.

Zone A8, A11: Special Flood Hazard Areas inundated by the 100-year flood, determined by detailed methods; base flood elevations shown and zones subdivided according to FHFs.

Zone B: Areas between the Special Flood Hazard Areas and the limits of the 500-year flood, including areas of the 500-year flood plain that are protected from the 100-year flood by dike, levee, or other water control structure; areas subject to certain types of 100-year shallow flooding where depths are less than 1.0 foot; or, areas subject to 100-year flooding from sources with drainage areas of less than one square mile. Zone B is not subdivided.

Zone C: Areas of minimal flooding.

Table 3, "Flood Insurance Zone Data", summarizes the flood elevation differences, FHFs, flood insurance zones, and base flood elevations for each flooding source studied in detail in Neola.

5.4 Flood Insurance Rate Map Description

The Flood Insurance Rate Map for the City of Neola is, for insurance purposes, the principal result of the Flood Insurance Study. This map (published separately) contains the official delineation of flood insurance zones and base flood elevation lines. Base flood elevation lines show the locations of the expected whole-foot water-surface elevations of the base (100-year) flood. This map is developed in accordance with the latest flood insurance map preparation guidelines published by the Federal Emergency Management Agency.

FLOODING SOURCE	PANEL[1]	ELEVATION DIFFERENCE BETWEEN 1% (100-YEAR) FLOOD AND[2]			FLOOD HAZARD FACTOR	ZONE	BASE FLOOD ELEVATION (FEET NGVD)[3]
		10% (10-YEAR)	2% (50-YEAR)	0.2% (500-YEAR)			
MOSQUITO CREEK							
Reach 1	0001	-4.0	-1.1	1.9	040	A8	Varies - See Map
Reach 2	0001	-5.7	-1.5	2.4	055	A11	Varies - See Map
NEOLA CREEK							
Reach 1	0001	-4.1	N/A	N/A	040	A8	Varies - See Map

[1]Flood Insurance Rate Map Panel [2]Weighted Average [3]Rounded to Nearest Foot

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF NEOLA , IOWA
(POTTAWATTAMIE COUNTY)

FLOOD INSURANCE ZONE DATA

MOSQUITO CREEK

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6.0 OTHER STUDIES

A Flood Insurance Study is currently in progress for the unincorporated areas of Pottawattamie County, Iowa (Reference 10). The results of the Pottawattamie County study will agree exactly with the Neola study.

A Flood Hazard Boundary Map has been published by the Federal Insurance Administration (Reference 12). The differences between the Flood Hazard Boundary Map and this study are justified due to the detailed nature of this Flood Insurance Study."

This report either supersedes or is compatible with all previous studies published on streams studied in this report and should be considered authoritative for the purposes of the National Flood Insurance Program.

7.0 LOCATION OF DATA

Information concerning the pertinent data used in preparation of this study can be obtained by contacting the Natural and Technological Hazards Division, Federal Emergency Management Agency , 911 Walnut Street, Kansas City, Missouri 64106.

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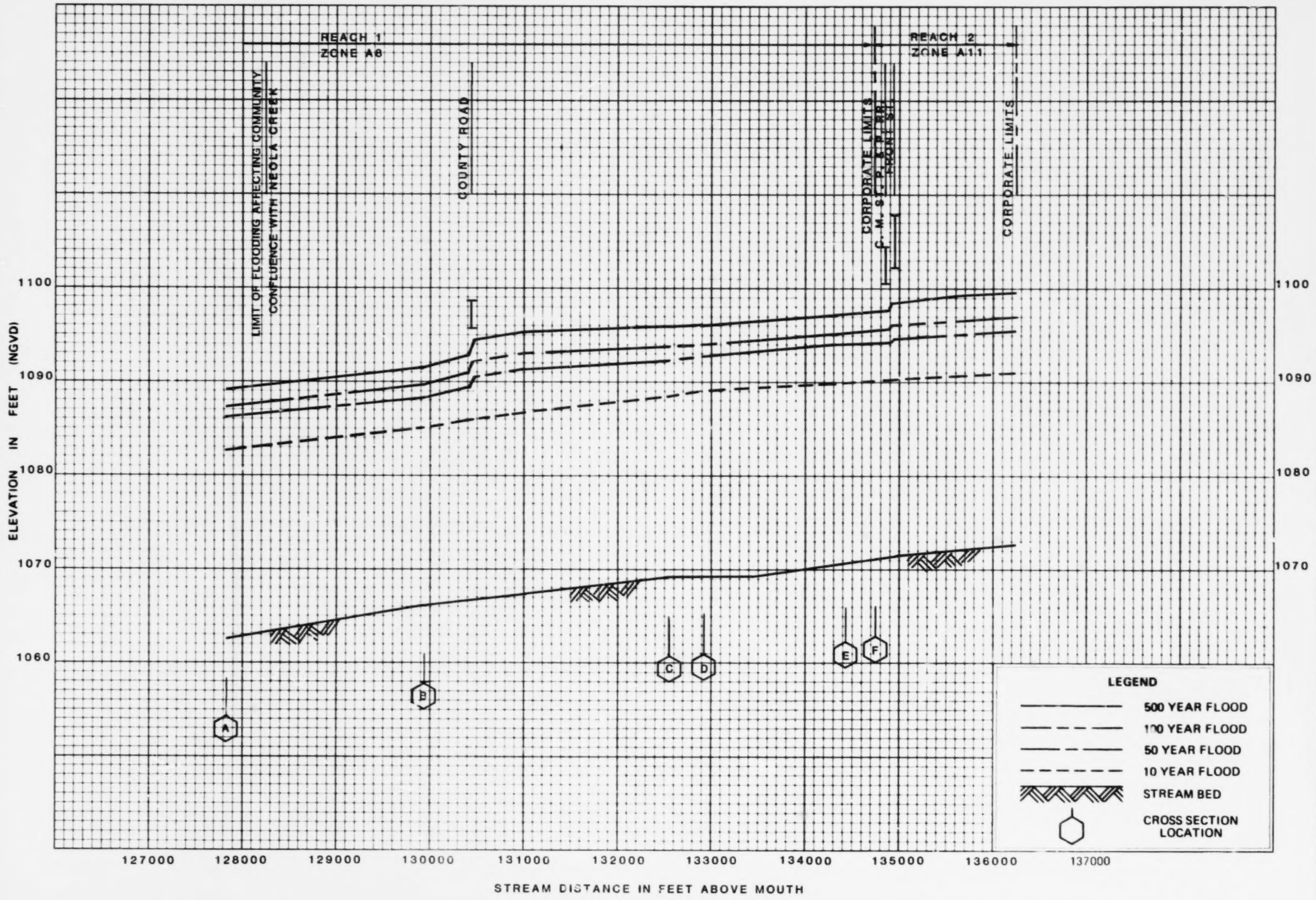

FLOOD PROFILES

MOSQUITO CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF NEOLA, IOWA
(POTTAWATTAMIE COUNTY)

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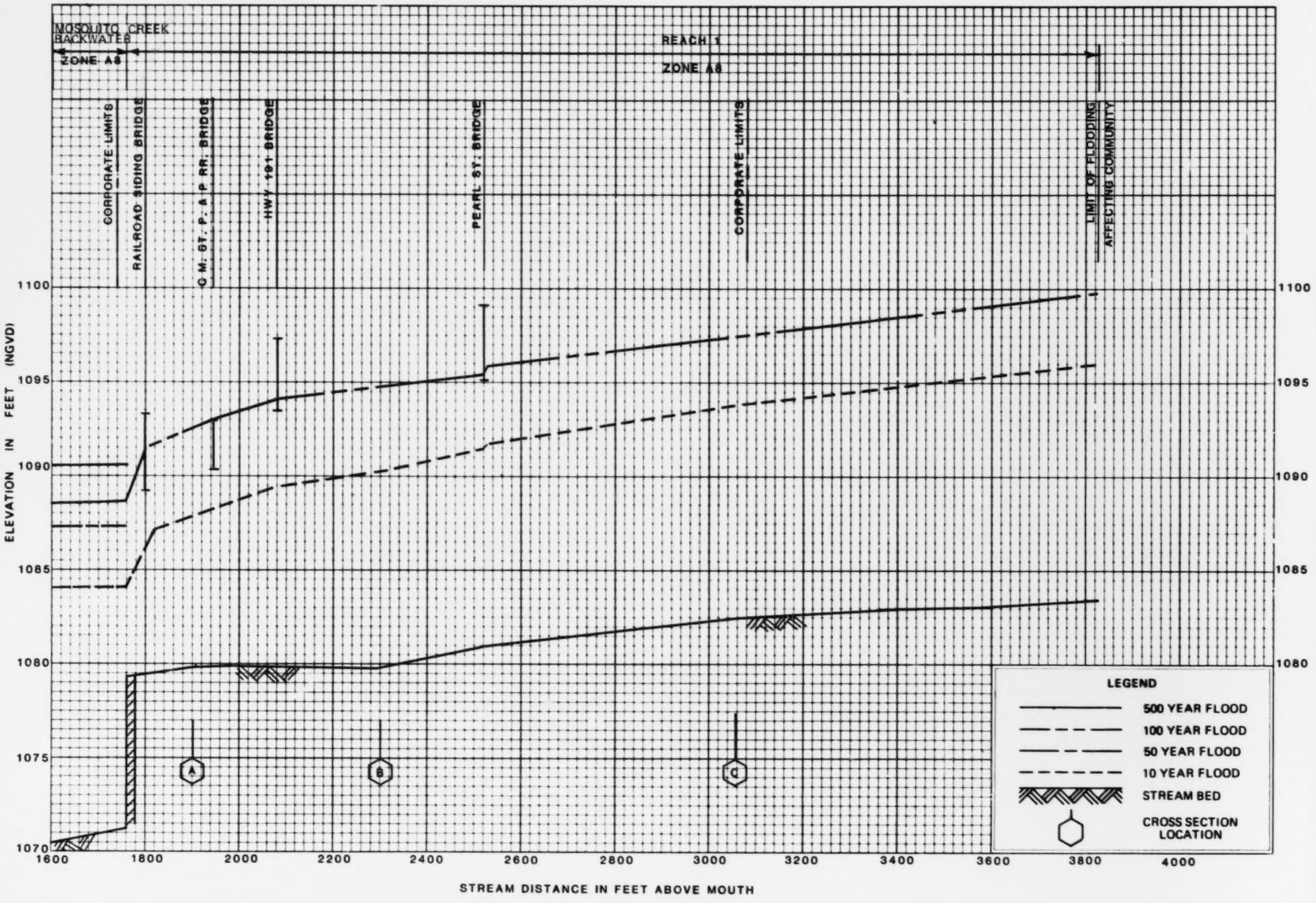

FLOOD PROFILES

NEOLA CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF NEOLA, IOWA
(POTTAWATTAMIE COUNTY)

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